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AUTOMATIC CONTAINER FILLING MACHINE

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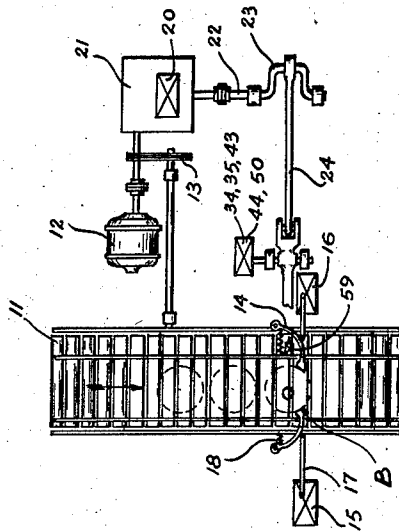
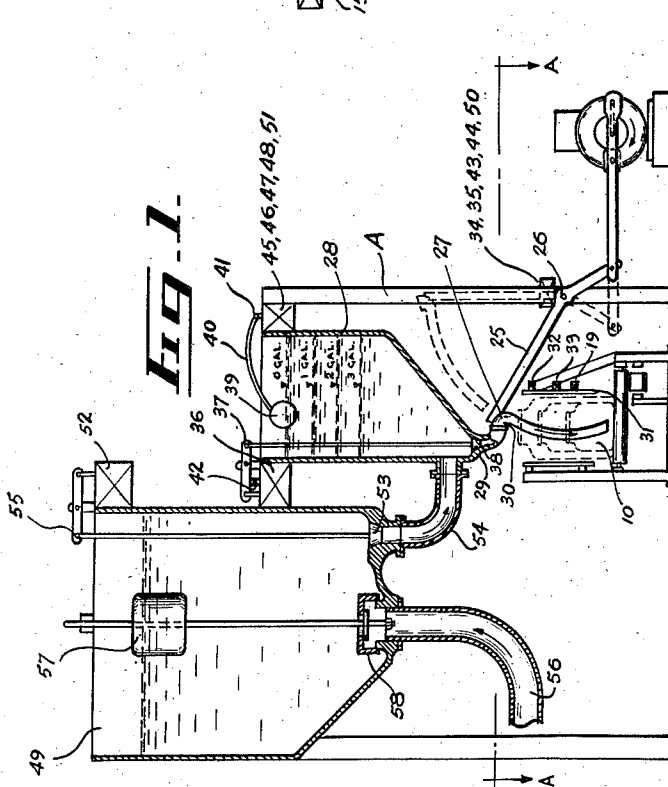


Fig. 2.



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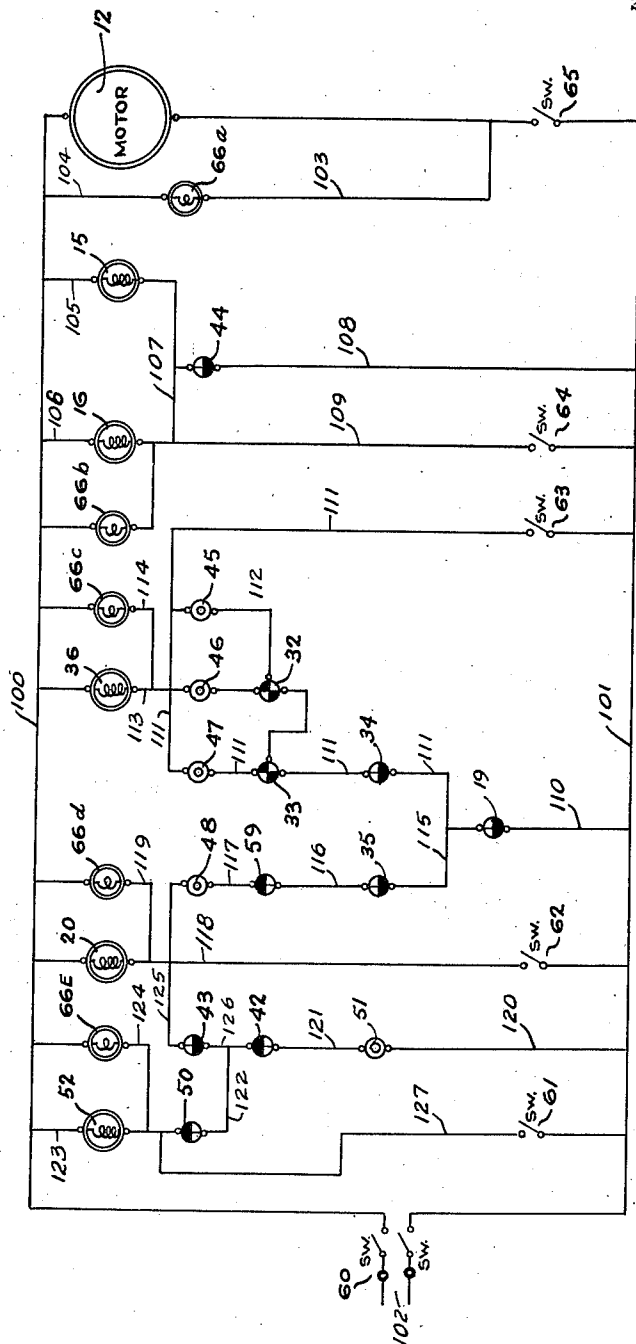


Fig. 3.

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AUTOMATIC CONTAINER FILLING MACHINE

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3 Claims. (Cl. 226—99)

This invention pertains to an apparatus for the filling of containers and, in particular, containers having a wide-mouthed opening wherein the operations of the machine are entirely automatic.

Modern merchandising technique is built around the sale of a packaged article. The advantages to be derived from the use of packaged articles in comparison with bulk or unpackaged articles are too many and too obvious to need enumeration. Packaging is, however, an expensive item and consequently the art has been directed to the production of equipment to perform the various operations in an automatic and speedy manner.

It is an object of the present invention to produce a machine adapted to fill containers having an opening of appreciable size in an automatic and continuous manner and requiring the minimum of supervision by operating personnel.

It is a further object of this invention to provide a machine adapted to fill containers having a range of predetermined capacities and regardless of the sequential presentation of such containers to the machine.

The machine of the present invention is adapted for use with most conventional marketable liquids and is constructed in such a manner that it may be readily cleaned and operated in a sanitary manner if so required. Furthermore, the apparatus of this invention is provided with safety features to prevent the loss of liquid, the delivery of an excessive amount of liquid to a container and the premature discharge of liquid when there is not a container available to receive such discharge.

The desirable objects enumerated above are achieved in the machine of the present invention which consists essentially of a liquid-holding supply tank adapted to deliver a predetermined quantity of liquid to the container to be filled. The liquid is delivered to the container through a movable nozzle which is adapted to be automatically inserted into the container and removed in the same manner when the container is filled. Conveying means are provided for delivering empty containers to the filling location and for removing the filled containers. Interlocking and control means are provided to initiate and terminate each cycle of operation without requiring human attention. Thus an incoming empty container is automatically stopped at a point where the delivery spout may enter the container and when stopped, then initiates the mechanism which inserts the spout into the container and simultaneously opens a valve in the supply tank permitting the appropriate quantity of liquid to be delivered to the container. Other control means are initiated when the proper quantity has been delivered to remove the spout from the container, release the filled container and to refill the supply tank from a reverse supply of liquid.

The invention will be more clearly understood by reference to the accompanying drawings in which:

Figure 1 is a side elevation view;

Figure 2 is a plan view illustrating particularly the conveyor mechanism; and

Figure 3 is a schematic drawing of the electrical circuit.

The invention will now be described in detail with particular reference to a container of volumetric capacity of 1, 2 and 3 gallons respectively. It should be understood, however, that these capacities are only illustrative and that the apparatus could be adapted to fill containers of other sizes by a simple adjustment which would come within the skill of an ordinary mechanic.

The term "liquid" as used throughout this specification

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and the appended claims is intended to apply to any fluid of relatively low viscosity. It will be obvious that liquids having a high viscosity and which will not flow properly might be incapable of being dispensed by means of the apparatus described herein. The inability to handle such fluids should not be considered as rendering the invention inoperative.

A general structural framework A is provided upon which the elements of the machine are disposed. This framework may be constructed of suitable material providing that the individual elements are properly functionally supported although they need not necessarily be arranged in the manner illustrated in the accompanying drawings.

The containers to be filled shown generally at 10 in Figure 1 are moved to the filling location by a suitable conveyor 11 such as the driven roller type shown in Figure 2. An electric motor or other source of power 12 provides energy to drive the conveyor 11. In the arrangement shown in Figure 2 a chain-drive arrangement 13 takes energy from a suitable gear mounted on a shaft of the motor 12 and suitable mechanical connections, not shown, drive the conveyor 11. It is within the scope of this invention to use any other suitable type of drive mechanism and conveyor arrangement as the particular arrangement illustrated is not essential to the operation of the present invention. It is advisable that the conveyor selected will be one capable of constant operation, in order that the empty containers may be constantly delivered to the filling apparatus and removed as soon as released by the filling apparatus, without necessitating separate controls to start and stop the conveyor.

When the empty containers 10 arrive at the filling area generally designated at B, they are stopped by a pair of pawls 14 arranged on each side of the conveyor. The pawls consist of arcuate arms pivotally mounted on the framework A and are activated by electromagnets 15 and 16 arranged on each side of the conveyor. When the cans are filled, suitable control elements, which will be described in greater detail later, actuate the electromagnets to pull the pawls in an outward direction and permit the conveyor to carry the filled cans past the filling point B and to bring an empty can to the filling position. The electromagnets 15 and 16 operate locking devices in the form of linear elements 17 which hold the pawls in a closed position. Tension springs 18 tend to pull the pawls to a closed position when the electromagnets are de-energized. The tension springs 18 are secured to the pawls 14 and to the frame A as shown in Figure 2.

An empty can arriving at the filling point B and stopped as described above, operates a pressure-sensitive electric switch such as a microswitch, shown at 19 in Figure 1. The switch 19 is closed from its normal open position and energizes an electromagnet 20 which in turn activates a half-revolution clutch 21 which is adapted for operative engagement with the motor 12. Mechanical energy is now transmitted from the motor 12 through the clutch 21, shaft 22 to a crank 23 causing linear motion of connecting rod 24 and lever 25 which is pivotally mounted on the shaft 26 extending from the frame A and causes the spout 27 to swing in an arcuate manner in and out of the containers 10. In the non-filling position the position of the spout 27 is illustrated by the dotted lines in Figure 1 and when actuated by the contact of the empty container on the microswitch 19, it swings downwardly into the empty container.

This operation will not take place unless the pawls 14 are in a position to stop the empty container in the filling station B and the liquid supply tank 28 is filled.

Providing that the above conditions have been met the spout 27 swings downwardly into a filling position and it will be noted that the spout 27 is curved in such a manner that liquid entering the empty containers will do so in a non-foaming manner. The liquid supply tank 28 terminates in a curved delivery pipe 29 and a non-leaking connection 30 is provided between the spout 27 and the pipe 29. Connection may be of any suitable type implying resilient, leak-proof and non-corrodible materials. The delivery of liquid to the empty container may now commence.

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Located along the wall 31 of the filling station are several pressure-sensitive switches which determine the amount of liquid which will enter a particular container and, in action, are controlled and operated by containers of respective sizes. The microswitch 32 is activated by a can having a volume of three gallons and the microswitch 33 is activated by a can of a two gallon capacity. Both of these switches are of a two-way type and both control mercury switches actuated by a float in the supply tank 28 to permit the correct volume of liquid to flow from the tank. A container of one-gallon capacity will actuate microswitch 19 which is also, of course, actuated by all sizes of container to cause the spout arrangement to enter the can. As stated, microswitch 19 also functions to permit one gallon of liquid to flow into a can of that capacity.

When the spout 27 reaches its lowest position inside the container 10 it activates the microswitch 34 by means of a finger mounted on the shaft 26. Also located at the same point is the microswitch 35 and operated in a similar manner which acts as soon as the spout 27 starts on its downward path to de-energize electromagnets 20 and the half-revolution clutch 21, otherwise the clutch would cause the nozzle to rise from its filling position to the non-filling position. The microswitch 34 is normally open and when closed activates electromagnet 36 which, by means of mechanical linkage 37, opens a valve 38 in the bottom of the tank 28 and permits liquid to flow downwardly through the spout into the container.

When the required amount of liquid has been delivered from the tank 28 depending upon the activation of microswitch 19, 32 or 33, depending upon the size of the container to be filled, the float 39 which is supported on the arm 40 and the shaft 41 causes one or more mercury switches or precision sensitive switches to open and de-energize the electromagnet 36 thus closing the valve 38.

The closing of the valve 38 when the required amount of liquid has flown from the tank 28 causes pressure-sensitive switch 42 to be closed by contact with the linkage 37. When the switch 42 is in the open position, that is when the electromagnet 36 opens, the valve 38 and the circuit to the electromagnet is, of course, open.

The closing of the valve 38 and the switch 42 causes the electromagnet 20 to, again, become activated providing that the nozzle 27 is at its lowest position and to raise the spout 27 from the filled container. When the spout 27 is at its lowest point the microswitch 43, which is activated by a finger on the shaft 26 is closed and the half-revolution clutch 21 engaged, causing the nozzle to start on its upward path. However, as soon as the nozzle leaves its lowest position the switch 43 is opened, thus preventing the clutch from making a complete revolution. The further upward movement of nozzle 27 closes microswitch 44 and energizes the electromagnets 15 and 16 and causes the locking mechanism 17 to be released. The pressure of the empty containers and the movement of the conveyor 11 will then cause the filled container to pass beyond the filling point B. The electromagnets 15 and 16 are energized by the upward movement of the spout 27 through the closing of the normally open microswitch 44 which is in itself closed by a finger on the shaft 26. The finger on the shaft 26 contacts the plunger on the microswitch 44 only for a brief period of time in the arcuate movement of the spout 27. Thus the electromagnets 15 and 16 are only energized for a brief period of time. When the pawls 14 are in the open position pressure-sensitive switch 59 which is normally closed, is opened preventing movement of the nozzle.

As previously stated, the amount of liquid which will flow from the tank 28 when the valve 38 is open is dependent upon the size of the container in the filling position B and the functioning of various position-sensitive switches associated with the shaft 41. The position-sensitive switches which may be of the liquid displacement type and employing mercury are physically located in a box or container 45 mounted near the top of the tank 28. Switches 25, 46 and 47 control the volume of liquid delivered from the tank 28 and are normally in a closed position, but as the float 39 sinks and the shaft 41 is rotated by the arm 40 these switches function in sequence to open the respective circuits and thus cause the valve 38 to close.

As the volume of liquid in the tank 28 has now been depleted it is necessary to refill the tank from the reserve supply tank 49 which is connected to a source of liquid.

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and is maintained at a constant level. As soon as the nozzle 27 leaves its lowest position within the container a microswitch 50 also activated by a finger on the shaft 26 closes and as the pressure-sensitive switch 42 and the position-sensitive switch 51 mounted on the arm 41 are, at this moment, both closed, the electromagnet 52 is energized and opens a valve 53 in the bottom of tank 49. The opening of the valve 53 permits liquid to flow from the tank 49 through the pipe or conduit 54 into the tank 28 until the float 39 reaches its uppermost position at which point it activates position-sensitive switch 51 secured to the shaft 41 and opens this switch and de-energizes electromagnet 52. The electromagnet 52 is coupled to the valve 53 by suitable linkage designated generally at 55.

The constant level tank 49 is filled by means of a pipe 56 from a source of supply of the liquid through a float 57 which actuates a valve 58 when the float reaches its uppermost point and closes off the supply of liquid entering through the pipe 56.

The valves 38, 53 and 58 have not been described in detail as any suitable valve structure which will accomplish the desired function may be used.

Referring now to Figure 3 it will be seen that an electric motor 12 is connected by conductors 100, 101 to a source of power 102 which is controlled by the double-pole single throw switch 60. Connected in parallel with the motor 12, by means of conductors 103, 104 is a pilot light 66a which signifies when the motor is in operation. A single-pole single throw switch 65 is in series with the motor to manually control this particular circuit. The electro-magnets 15 and 16 are connected to conductor 100 by wires 105, 106 and are joined by wire 107 to microswitch 44 which is connected to conductor 101 by conductor 108. Thus, closing of switch 44 actuates electromagnets 15 and 16 to close the pawls 14. The pilot lamp 66b is in parallel with the electro-magnets to indicate by the lighting of the lamp that the electromagnets are in operation. Switch 64 is inserted between conductors 107 and 101, along conductor 109 to manually control the circuit. The switch 19 is connected by conductor 110 to conductor 101 and is connected in series with switch 34 through switches 33, 47 and 63 by conductor 111. Switch 33 is also connected to switch 32 which is in series with switch 45 by means of conductor 112. Switches 45, 46, 47 are in parallel between conductors 111 and 112. Conductor 111 is also connected to electromagnet 36 by conductor 113 which is by-passed by pilot light 66c along conductor 114. Switch 19 is also connected in series with switch 35, 59 and 48 and manual switch 62 along conductor 115, 116, 117 and 118 respectively. Manual switch 62 is inserted to give the operator positive control of the circuit. Conductor 118 leads also to electromagnet 20 which again is by-passed by pilot light 66d on conductor 119. Conductor 120, switch 51, conductor 121, switch 42, conductor 122, switch 50, electromagnet 52 and conductor 123 are in series and in parallel with the motor 12 and conductors 101 and 100. Pilot lamp 66e by-passes electro-magnet 52 along conductor 124. Switch 43 is connected by conductors 125 and 126 to switch 48. Manually actuated switch 61 is along conductor 127 between conductor 101 and conductor 124.

The half-revolution clutch 21 may be of any suitable construction.

We claim:

1. An automatic container filling machine comprising in combination a conveyor adapted to deliver empty containers and to remove filled containers, gates to restrain said containers in filling position, switches actuated by an empty container to energize an electric motor to cause a filling spout pivotally mounted separately from a supply tank to be inserted within the empty container, a further switch controlled by the empty container and the filling spout to energize an electro magnet which operates a valve to cause a quantity of liquid to flow from said supply tank to the empty container, a switch controlled by the removal of liquid from the tank to cause the flow of liquid to be stopped, the filling nozzle to be removed from the filled container and the container restraining gates to be released and a new sequence of operations initiated by the removal of the filled container and the activation of the apparatus by a new empty container.

2. An automatic container filling machine as claimed in claim 1 in which the switches actuated by the empty containers to cause the spout to enter the container are placed vertically one above the other so that a container

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equal to the height of the lowest switch actuates said lowest switch to cause a predetermined quantity of liquid to flow, a container equal to the height of next higher switch actuates said next higher switch and a container equal to the height of the highest switch actuates said highest switch, the size of the containers being proportional to their height and means actuated by each switch to cause the delivery of an amount of liquid equal to the capacity of the container which actuated the switch.

3. An automatic container filling machine comprising in combination a conveyor adopted to deliver empty containers and to remove filled containers, gates to restrain said containers in filling position, a set of switches set vertically one above the other beside the conveyor to be actuated by the arrival of an empty container the lowest switch being actuated by each container arriving at the machine and energizing an electric motor to cause a filling spout pivotally mounted separately from a supply tank to be inserted in an empty container, a further switch actuated by the filling spout and the empty container to energize an electromagnet which operates a valve to cause

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a quantity of liquid to flow from the supply tank to the empty container, the quantity of liquid allowed to flow being governed by which of the three vertically placed switches is actuated by the top of the container, the volume of the container being in proportion to its height so that a tall container will receive the largest volume of liquid, a switch controlled by a float which measures the volume of liquid delivered, to cause the flow of liquid to be stopped, the filling spout to be removed from the filled container and the container restraining gates released and a new sequence of operations initiated by the removal of the filled container and the arrival of a new empty container.

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